Geology Survey

1956 - Springfield

ILLINOIS STATE ACADEMY OF SCIENCE
GEOLOGY FIELD TRIP

# GUIDE LEAFLET

## SPRINGFIELD AREA

MAY 5, 1956

Sangamon County
Springfield and Divernon Quadrangles



Leader

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Accompanying map prepared by
ILLINOIS STATE GEOLOGICAL SURVEY, URBANA
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SPRINGFIELD AREA

FIELD TRIP FOR ILLINOIS ACADEMY OF SCIENCE

ITINERARY



Suggestion: Ask one passenger in car to read itinerary aloud as trip proceeds.

| Dis-tance | Mile-age | |
|---|---|---|
| 0.0 | 0.0 | Assemble at Fairgrounds, south gate, cars headed east. |
| 0.2 | 0.2 | Stop. Intersection of Routes 54 and City-U.S. 66. Turn left (north) on Route 66. |
| 3.0 | 3.2 | Sangamon River. Note the sandstone on left side of north bank. The sandstone is the Trivoli sandstone of Pennsylvanian or Coal Measures age. |
| 0.2 | 3.4 | CAUTION. Turn left, then right on Illinois Route 124. |
| 1.6 | 5.0 | Turn left. |
| 0.3 | 5.3 | Turn right. We are crossing the Jacksonville till plain, deposited during one of the substages of the Illinoian glaciation. Note how flat the land is. |
| 5.7 | 11.0 | Turn right. |
| 2.0 | 13.0 | You are now at the outer margin of the Buffalo Hart Moraine, here characterized by low hills. |
| 1.6 | 14.6 | STOP 1. A crevasse deposit on the Buffalo Hart moraine. |

Tens and hundreds of thousands of years ago most of Illinois (with most of northern North America) was covered by huge ice-sheets or glaciers. The glaciers expanded from centers in what is now eastern Canada. They developed when, for some reason not yet known, the mean annual temperatures were somewhat lower than now, so that not all of the snow that fell during the winters was melted during the summers. The snow residues accumulated year after year until they formed a sheet of ice so thick that its own weight caused the lowermost part to flow outward, carrying with it the soil and rocks on which it rested and over which it moved. The process continued until the glacier extended into our country as far south as Missouri and Ohio rivers.

Mild temperatures halted the glacier. For a while the ice melted as fast as it moved forward so that its margin remained stationary. Later the ice melted faster than it moved forward and the ice front gradually melted back until the glacier disappeared.

As the glacier melted, it released its load of soil and rocks, or drift, which it had picked up as it advanced. Some of the material was deposited in place as the ice melted. Such material is a thorough mixture of all kinds and sizes of rocks and is known as till. Some of the glacial drift was washed out with the melt-waters. The coarsest outwash material was deposited nearest the ice-front and increasingly finer

material was deposited farther away. The finest clay may have been carried all the way to the ocean. Where the outwash material was spread widely in front of the glacier it forms an outwash-plain; where it was restricted to the river valleys it forms valley-trains.

At times, especially in the winters, the outwash-plains and valley-trains were exposed as the melt-waters subsided. The wind picked up silt and fine sand from their surfaces, blew it across the country, and dropped it to form deposits of what is known as loess. Glacial loess mantles most of Illinois. Near the large river valleys loess may be as much as 60 to 80 feet thick. Far from the valleys it may be measured only in inches, if it can be identified at all.

We know there were four major periods of glaciation during the Pleistocene or Great Ice Age (see accompanying table), and that between each pair of glaciers there was a long iterglacial period in which conditions were about as they are today. During each major glaciation the ice advanced and retreated a number of times, particularly during the last or Wisconsin glacial stage.

We know the Springfield region, like the rest of southern and western Illinois, was invaded by glaciers during the Kansan and Illinoian (second and third) glacial stages, for we find glacial drift of these ages. Probably the region was invaded by the Nebraskan or oldest glacier, although no Nebraskan materials have been identified. The Wisconsin (fourth) glacial stage is represented by loess, outwash, and wind-blown sand.

The position of the ice-front at each advance of the glacier is usually marked by a ridge of till or moraine. The moraine represents accumulation of drift at the ice-margin while advance and melting of the ice were in balance and when more and more material was being brought to the edge by the advancing ice. When melting exceeded advance, so that the ice-front retreated, the resulting drift deposits form a drift-plain or till-plain, whose surface may be almost level or somewhat billowy.

This stop is on top of a crevasse deposit along the Buffalo Hart moraine. The Buffalo Hart moraine is a low broad moraine with numerous high hills and ridges. The moraine marks the limit of the glacier during the third or youngest substage of the Illinoian stage. The hills and ridges mark the positions of crevasses in the glacier, in which material accumulated in excess over what was borne in the glacier itself. Outside the moraine, to the southwest, is the drift-plain of the Jacksonville substage, which is almost flat. Although the Buffalo Hart drift-plain to the northeast is also relatively flat, it is not as flat as the Jacksonville drift-plain but is characterized by low swells and swales, 5 to 10 feet in relief.

0.7 15.3 Stop. Route 66. Turn right on 66.

2.0 17.3 Caution. Town of Williamsville, RR crossing. Leave Route 66 and continue straight south.

0.8 18.1 Outer margin of the Buffalo Hart moraine. To the south is the Jacksonville till-plain.

5.6 23.7 Stop. U.S. Route 54. Turn right on 54.

0.6 24.3 STOP 2. Sand Dunes.

During Wisconsin time the Sangamon River valley carried great quantities of glacial melt-water which dumped outwash gravel to form a valley-train. Later the river cut a new channel into the valley-train. The top level of the valley-train is now marked by terraces along the sides of the valley. Some of the finer sands were blown from the valley and were deposited on the uplands along the valley where they accumulated as sand dunes. The dunes are now covered with grass.

2.0 26.3 Turn right (south) from Route 54 onto gravel road.

0.8 27.1 Stop. Turn left (east).

1.4 28.5 Stop. Intersection with U.S. Route 36. Straight ahead, then left (north) on Route 36, across the valley of Sangamon River. Note the numerous old channels in the river bottom. The present river meanders over a wide flat but the valley-walls are in bedrock.

1.3 29.8 Note the sand dunes east of Riverton.

1.3 30.8 STOP 3. Soil profile at underpass under Illinois Terminal Railroad.

The uppermost glacial deposits in the Springfield region are loesses of Wisconsin age, three in number. The latest and topmost was deposited principally during the Tazewell substage, and on it has developed the present surficial soil or weathering profile. It is generally buff in color.

The second loess was deposited during the Iowan substage and is generally gray in color. The time interval between the deposition of the Iowan loess and later deposits was too brief for a weathering profile to be developed, but where the Iowan loess is thin it may be noncalcareous, presumably because it was leached as rapidly as it was deposited.

In much of Illinois the Iowan and later Wisconsin loesses cannot be readily differentiated, and they are usually designated together as the Peorian loess.

The first and oldest Wisconsin loess is the Farmdale. It is typically chocolate brown in color. It is also generally leached, presumably because it was deposited so slowly that it was leached as it was deposited. However, the time interval between the deposition of the Farmdale and Iowan loesses was sufficient that some humus and locally peaty or even woody material accumulated at the top of the Farmdale loess. Where the Farmdale loess is only a few inches thick and lies on well-developed Sangamon soil, the two cannot be readily differentiated.

Like many other things, rocks and minerals suffer changes when they are exposed to the weather. Although these changes are relatively slow, they become evident in earth deposits that are not disturbed over long periods of time and develop what is known as a weathering or soil profile in the surficial part of such deposits.

Following the practice established about 30 years ago by the Russian Glinka, soil scientists usually consider that the soil or weathering profile consists of 3 zones, designated A, B, and C from top down. The

A zone is the "soil" zone, which is normally black or gray in color. The B zone is the "subsoil" zone, and the C zone is the unaltered parent material.

The zonal effect results from the fact that the four principal processes which cause soil weathering all progress with the downward movement of groundwater but at different rates. These processes, listed according to their rate of progress and beginning with the most rapid, are: (1) oxidation, (2) leaching of carbonates, (3) decomposition of more resistant minerals, and (4) accumulation of humus.

Consequently, in the A zone, in which humus from decaying plants has accumulated, the rock minerals are oxidized, leached, and decomposed. In the upper part of the B zone they are oxidized and leached, and in the lower part of the B zone they are only oxidized. The oxidation zone is shown by the reddish or yellowish color resulting from the oxidation of iron minerals. The leached zone is determined by the absence of carbonates, as revealed by tests with a solution of hydrochloric acid.

The typical soil profile is developed on deposits of Tazewell age at this stop. The excavation for the underpass has exposed deposits of the Wisconsin stage of glaciation as follows:

| | Thickness Ft. | In. |
|---|---|---|
| Recent | | |
| Soil, gray, carbonaceous (loess) . . . . . . . . . . | 1 | 6 |
| Peorian | | |
| Loess, tan to gray, weathered, noncalcareous, with loess kindchen (concretions) . . . . . . . . . . . | 3 | |
| (Tazewell) | | |
| Lake silt, light gray, fine-grained, discontinuous, lenticular . . . . . . . . . . . . . . . . . . . . . | | 0-18 |
| Sand, medium- to fine-grained, reddish (dune sand) . | 3 | |
| Sand, light gray, fine-grained, water-bearing, unweathered . . . . . . . . . . . . . . . . . . . . . | 1 | |
| Peat, earthy, black, moist . . . . . . . . . . . . . | 1 | 6 |
| Sand, light gray, fine-grained, unweathered, water-bearing . . . . . . . . . . . . . . . . . . . . . | 1 | |
| Covered interval to base of cut | | |

1.2 32.0 Turn right (west). Sand dunes are evident on the upland here. To the southwest is the Sangamon valley in which terrace deposits make the "second bottom."

Almost immediately after turning the corner the road drops down to the terrace level. This is one of the remnants of the great deposits of sand and gravel outwash dumped into Sangamon valley during the Wisconsin stage of glaciation.

0.7 32.7 Turn left into parking area at gravel pit.

STOP 4. Gravel pit.

The company is dredging gravel from the valley-train outwash of Tazewell age. The sand and gravel is as much as 65 feet thick. The gravel is washed, screened, sized, and hauled to a sand and gravel yard nearer Springfield, which we will pass later.

Sand and gravel is an important mineral resource in construction work of all sorts. Too heavy to bear the cost of expensive transportation, sand and gravel is sought near building sites.

Leave parking area and turn left (west) on gravel road.

As you cross the bridge over Sangamon River, note the shale above the No. 8 coal. This coal, seldom more than 18 inches thick, was mined in the Springfield area many years ago.

1.3 34.0 Stop. U.S. Route 36. Turn left onto Route 36. Watch on the left (east) for the sand and gravel yard.

3.0 37.0 Stop. U.S. Route 66. Turn left onto Route 66.

1.8 38.8 Caution. Turn right (west) on road to pit of the Poston Brick Company.

0.2 39.0 STOP 5. Shale pit.

The section exposed here is as follows:

| | Thickness Ft. | In. |
|---|---|---|
| Peorian | | |
| Loess, gray, weathered, carbonaceous, noncalcareous | | 7 |
| Loess, tan-buff, weathered, noncalcareous . . . . . | 1 | |
| Loess, buff-brown, with ironstain, grades down into | 4 | 9 |
| Loess, gray, very fine-grained, irregular brown-stained areas . . . . . . . . . . . . . . . . . . . . | 1 | 4 |
| Farmdale | | |
| Loess, pink to tan, denser and harder than above, noncalcareous . . . . . . . . . . . . . . . . . . . . | 4 | 3 |
| Loess, mottled gray and brown, noncalcareous . . . | | 4 |
| Sangamon | | |
| Soil, gray, fine, carbonaceous . . . . . . . . . . . | | 0-2 |
| Jacksonville drift | | |
| Till, weathered, oxidized, brown to tan, with iron-stains; small quartz pebbles in till portions, noncalcareous . . . . . . . . . . . . . . . . . . . . | | 4 |
| Till, brownish-gray, with many quartz pebbles . . . | 4 | |
| Till, gray, faintly calcareous, with limestone pebbles . . . . . . . . . . . . . . . . . . . . . | 1 | 3 |
| Pennsylvanian | | |
| Shale, medium gray, medium-grained, micaceous, carbonaceous, well laminated, heavy bedded in part | 25 | |

Pleistocene deposits

Below the Peorian loess, which was discussed at Stop 3, there are exposed older deposits of Pleistocene age. The youngest is the Farmdale loess, which belongs to the oldest substage of Wisconsin glaciation.

Below the Farmdale deposits there is about 6 feet of Illinoian till greatly weathered during the succeeding Sangamon interglacial stage. Geologic studies of the soil profiles developed on the older drifts - Illinoian, Kansan, and Nebraskan - reveal that they can be divided into 5 zones, or horizons, instead of the 3 first recognized by Glinka in the soil profile developed on the Wisconsin drift. In order to avoid

confusion they have been designated by numbers instead of by letters.

Horizon 1 is the old "soil" or humus zone. Horizon 2 is a dense layer, very gummy and plastic when wet, very hard when dry. Horizon 3 is the leached and oxidized zone, and Horizon 4 is the oxidized but calcareous zone. Horizon 5 is the unaltered parent material.

The development of 5 instead of 3 recognizable zones in the old drifts results from the fact that they are much more weathered. The total thickness of the weathering on the old drifts is much greater than on the Wisconson drift, even where they are overlain by younger drifts. Oxidation, leaching, and decomposition of minerals have all progressed deeper. In addition, another process, the downward transfer of clay minerals derived from the decomposition of other minerals originally in the drifts, has not only left Horizon 1 more silty than it was originally but has made Horizon 2 much denser and more plastic than it was originally. This dense, plastic "gumbo" horizon is so little developed on Wisconsin drift that it is not differentiated.

Pennsylvanian formations

The formations of the Pennsylvanian (Coal Measures) system occur in repeated sequences or cycles, called cyclothems. Each cyclothem seems to record a recession and a readvance of the seas in which the sediments were deposited. The accompanying diagram shows the succession of beds in an ideal cyclothem. Rarely are all of the beds found in any one cyclothem. More than 50 cyclothems have been identified in Illinois.

The Trivoli cyclothem contains No. 8 coal; the coal was mined locally at an early date near Springfield.

The shale overlying the No. 8 coal is being mined here for use in the manufacture of light-weight aggregate and brick. In some places in Illinois loess is also used to make brick.

The St. David cyclothem contains coal No. 5, also called the Springfield coal, which ranges in thickness from 4½ to 6 feet and occurs at depths from 130 to nearly 300 feet. Much of coal No. 5 has been mined from below Springfield and its suburbs, for the area is one of the most intensively mined areas in the State. In Sangamon County more than 65 square miles of No. 5 coal have been mined, but an even larger area remains unmined.

In the southern part of Sangamon County No. 6 coal has been mined and is currently mined at the Peabody No. 10 mine. More than 18 square miles of No. 6 coal has been removed.

Coal remains a resource of great importance to the Illinois economy.

0.2 39.2 Turn around and return to highway. Stop. Turn right.

2.9 42.1 Follow Route 66 ByPass. Stop for intersection with City 66. Turn left.

4.6 46.7 Follow Route 66. Cross the bridge over Lake Springfield. Slow. Turn left.

0.8 47.5 Follow woodland drive. Go over the Illinois Central tracks, slow, turn

left into West Cotton Hill Park.

0.1 47.6 STOP 6. LUNCH.

0.1 47.7 Return to highway. Stop. Turn right.

0.8 48.5 Return to Route 66. Stop. Caution. Turn left.

0.4 48.9 Follow Route 66 to first road to the right.

0.2 49.1 Follow road to park entrance. Park cars.

STOP 7. Crows Mill limestone.

Here we have the Crows Mill limestone, which has been correlated with the Shoal Creek limestone. Here it is comparatively pure. When the original state capitol building was built, this locality served as one of the quarries. There are abundant fossils to be found in this outcrop, brachiopods and corals especially.

Note the peculiar pattern of erosion upon the surface of the rock.

0.7 49.8 Follow road south. Stop. Proceed.

0.3 50.1 Follow road south, turn right.

0.3 50.4 Stop, Route 66. Proceed with caution.

0.5 50.9 Caution. RR crossing.

0.7 51.6 Slow. Turn left.

1.5 53.1 Stop. Turn right (east).

1.5 54.6 Slow. Continue straight ahead, leaving winding lake road.

0.2 54.8 Slow. Turn right and left.

0.3 55.1 Slow. Turn left (north).

0.3 55.4 Slow. Turn right (east).

0.4 55.8 Slow. Turn left (north), enter gate and proceed across pasture to abandoned quarry.

STOP 8. Pleistocene and Pennsylvanian section.

The stone exposed here was also used for quarry stone and as late as 1942 was used for building and road purposes. The surficial material is very interesting; let us compare the section here with that at Stop 5. The section is as follows:

| | Thickness Ft. | In. |
|---|---|---|
| Loess, gray, filled with organic material . . . . . | 1 | |
| Loess, tan, sticky when wet . . . . . . . . . . . . | 1 | 6 |
| Loess, tan, less sticky and more compact than above | 3 | 6 |
| Loess or silt, buff, faintly laminated . . . . . . . | 3 | |

| | Thickness Ft. | In. |
|---|---|---|
| Silt, buff to chocolate colored, with quartz pebbles | 2 | |
| Weathered gravel with iron and manganese stain . . . | 2 | |
| Gravelly till, reddish-brown . . . . . . . . . . . . . | 5 | |
| Till, hard, sandy, with lenses of fine, buff silt in the lower portion . . . . . . . . . . . . . . . . | 7 | |
| Till, brown and gray, laminated, gravelly . . . . . . | 1 | 6 |
| Till, gray, hard, compact with limestone pebbles . . | 2 | |
| Till, brown, without quartz pebbles, and with deeply weathered boulders . . . . . . . . . . . . . . . . . | 2 | |
| Till, gray-brown, with many pebbles . . . . . . . . . | | 3 |
| Sandstone, light gray, medium grained, grades down to limestone. The upper surface is glacially striated, and the joint pattern is well developed . . . . . . | | 6 |
| Limestone, buff to tan, impure, very fossiliferous, with lenses of light gray, medium grained sandstone. Some limestone benches are cross-bedded; numerous large brachiopods and crinoid stems . . . . . . . . | 5 | |
| Covered interval . . . . . . . . . . . . . . . . . . . | 3 | |
| Limestone, impure, medium gray to buff, very fossiliferous, and weak . . . . . . . . . . . . . . . . . . | | 10 |
| Shale, buff-tan, weak calcareous, fossiliferous . . . | | 4 |
| Siltstone, thinly laminated, greenish-gray, shaly, fossiliferous . . . . . . . . . . . . . . . . . . . . | 2 | |
| Sandstone, greenish-gray, fine, fairly hard . . . . . | | 4 |
| Shale, light greenish-gray, coarse, silty . . . . . . | 2 | |

The section in the Pleistocene and the Pennsylvanian is a most interesting one. The glacial deposits and glacial straie are very interesting. The nature of the Pennsylvanian sediments offers an opportunity to study the possibilities of the origin of such sediments.

***

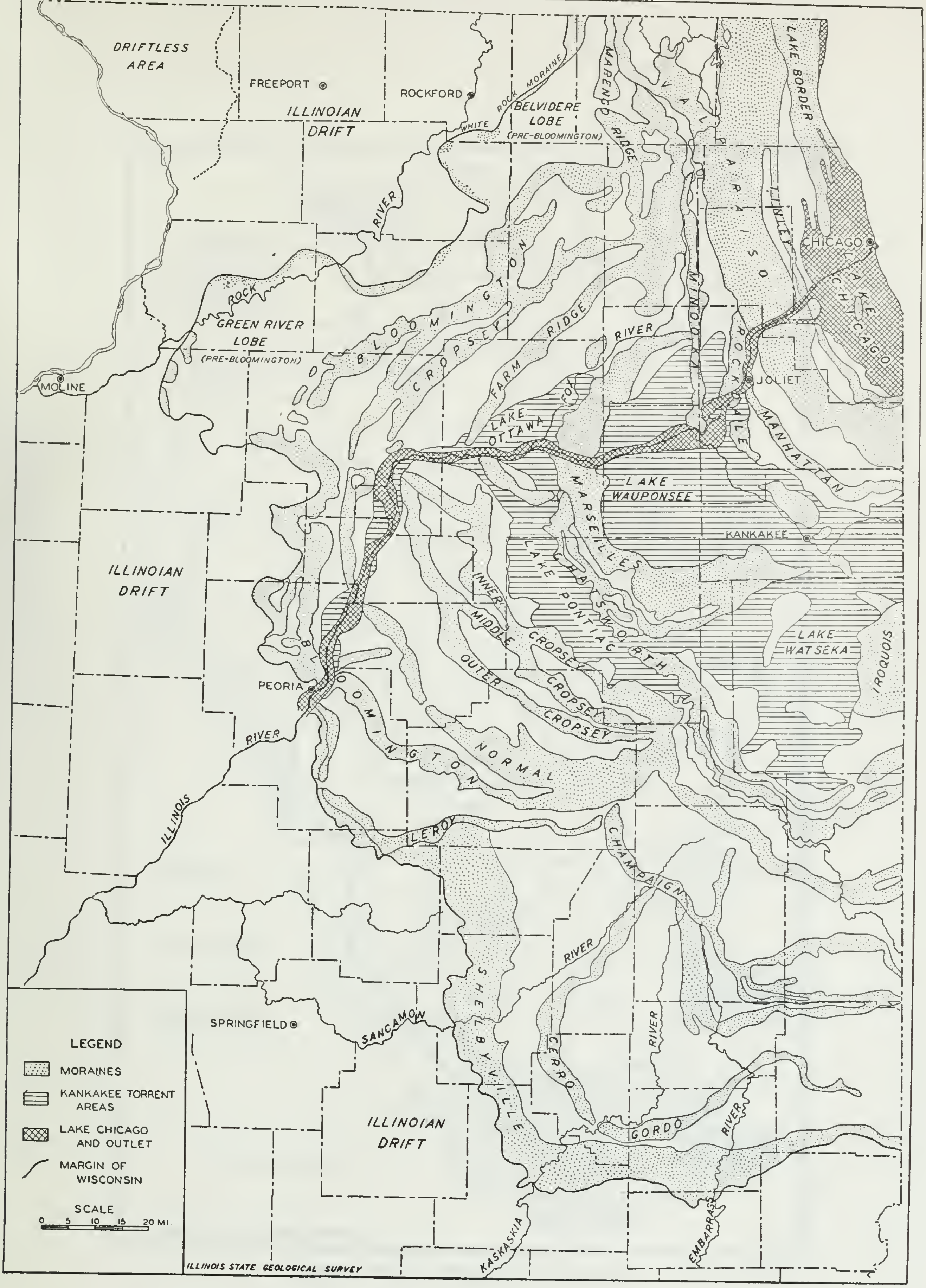
Thanks for Coming!

CLASSIFICATION OF PLEISTOCENE GLACIATION
(after M. M. Leighton and H. B. Willman, 1950)

| STAGES | SUB-STAGES | NATURE OF DEPOSITS | |
|---|---|---|---|
| Recent | | Soil (infantile to youthful profile of weathering), lake and river deposits, dunes, peat | |
| Wisconsin (4th glacial) | Mankato ) Cary ) | No recognized deposits in Springfield area ) | Peorian |
| | Tazewell | Outwash sand and gravel, loess, dunes, lake deposits ) | Peorian |
| | Iowan | Loess ) | Peorian |
| | Farmdale | Loess | |
| Sangamon (3rd interglacial) | | Soil (mature profile of weathering), alluvium, peat | |
| Illinoian (3rd glacial) | Buffalo Hart | Drift | |
| | Jacksonville | Drift | |
| | Payson (terminal) | Drift | |
| | Loveland (Pro.-Ill.) | Loess (in advance of glaciation) | |
| Yarmouth (2nd interglacial) | | Soil (mature profile of weathering), alluvium, peat | |
| Kansan (2nd glacial) | | Drift<br>Loess | |
| Aftonian (1st interglacial) | | Soil (mature profile of weathering), alluvium, peat | |
| Nebraskan (1st glacial) | | Drift | |

GENERALIZED GEOLOGIC COLUMN
FOR THE SPRINGFIELD AREA

| ERAS | PERIODS | EPOCHS | FORMATIONS |
|---|---|---|---|
| Cenozoic | Quaternary | Pleistocene | (See detailed classification of Pleistocene) |
| | Tertiary | Pliocene )<br>Miocene )<br>Oligocene )<br>Eocene )<br>Paleocene ) | Present in extreme southern Illinois only |
| Mesozoic | Cretaceous | | Present in extreme southern Illinois only |
| | Jurassic | | Not present in Illinois |
| | Triassic | | Not present in Illinois |
| | Permian | | Not present in Illinois |
| Paleozoic | Pennsylvanian | | Sandstone, siltstone, limestone, shale, clay, coal |
| | Mississippian | Chester | Not present in Springfield area |
| | | Iowa | St. Louis, Salem, Warsaw-Keokuk, Burlington, and Kinderhook |
| | Devonian | | Limestone and sandstone |
| | Silurian | | Limestone and dolomite. Oil production in Mt. Auburn area, Sangamon Co. |
| | Ordovician | | Shale, limestone, and sandstone |
| | Cambrian | | Dolomite and sandstone |
| Proterozoic<br>Archeozoic | Referred to as "Pre-Cambrian" time | | |




**GLACIAL GEOLOGY IN NORTHEASTERN ILLINOIS**
Compiled by George E. Ekblaw from data furnished by the Survey
January 1, 1942

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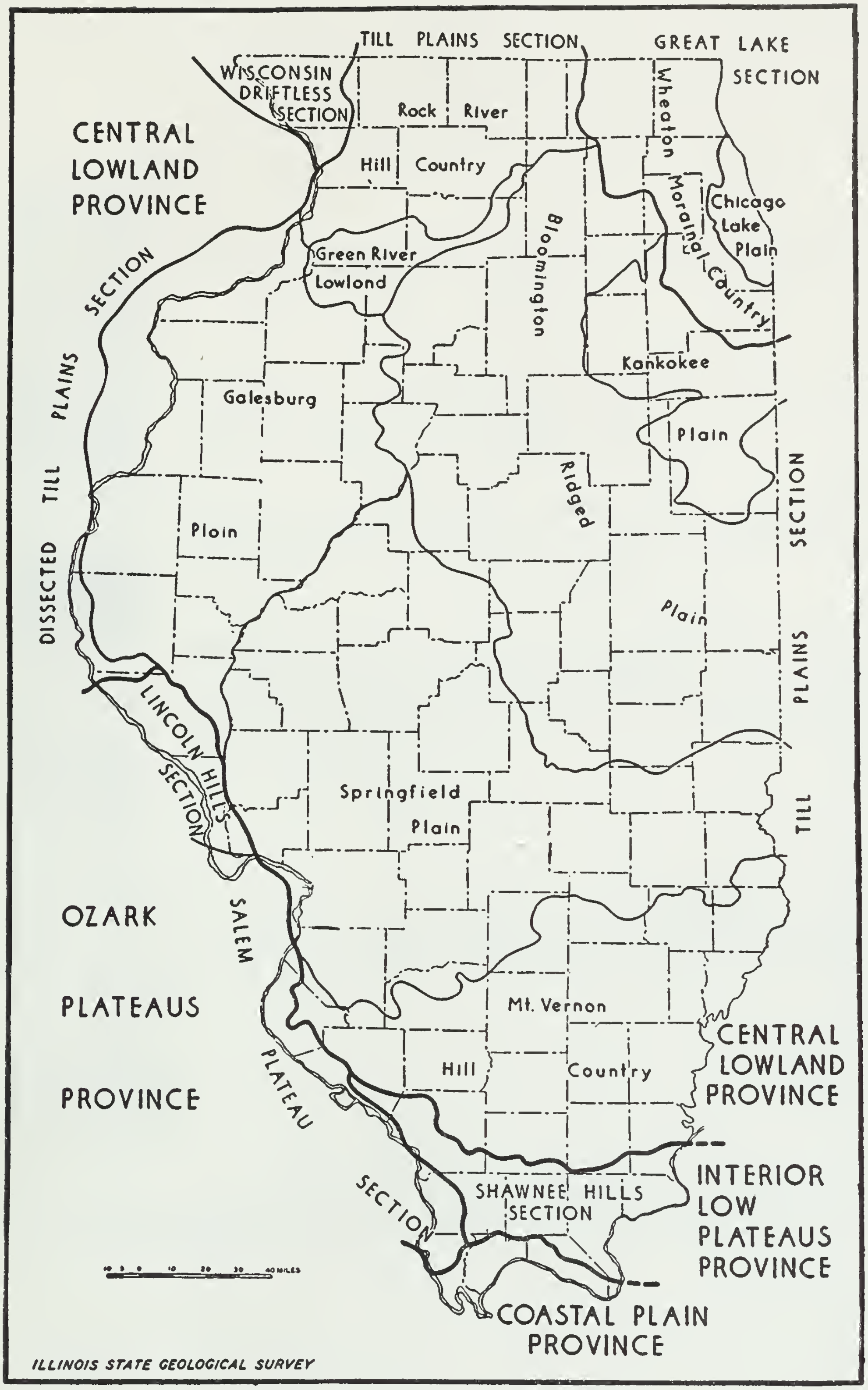


PHYSIOGRAPHIC DIVISIONS OF ILLINOIS

(Reprinted from Report of Investigations No. 129, Physiographic Divisions of Illinois, by M. M. Leighton, George E. Ekblaw, and Leland Horberg)

10 Shale, gray, sandy at top; contains marine fossils and ironstone concretions especially in lower part.

9 Limestone; contains marine fossils.

8 Shale, black, hard, laminated; contains large spheroidal concretions ("Niggerheads") and marine fossils.

7 Limestone; contains marine fossils.

6 Shale, gray; pyritic nodules and ironstone concretions common at base; plant fossils locally common at base; marine fossils rare.

5 Coal; locally contains clay or shale partings.

4 Underclay, mostly medium to light gray except dark gray at top; upper part noncalcareous, lower part calcareous.

3 Limestone, argillaceous; occurs in nodules or discontinuous beds; usually nonfossiliferous.

2 Shale, gray, sandy.

1 Sandstone, fine-grained, micaceous, and siltstone, argillaceous; variable from massive to thin-bedded; usually with an uneven lower surface.

AN IDEALLY COMPLETE CYCLOTHEM

(Reprinted from Fig. 42, Bulletin No. 66, Geology and Mineral Resources of the Marseilles, Ottawa, and Streator Quadrangles, by H. B. Willman and J. Norman Payne)

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